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UNESCO/SCOR/NIO Symposium on Warm Water Zooplankton

An international symposium on Warm Water Zooplankton was held at the National Institute of Oceanography (NIO), Goa, from 14 to 19 October 1976. This was sponsored jointly by Unesco Scientific Committee on Oceanic Research (SCOR) and NIO. Twenty foreign delegates representing USA, UK, Canada, France, Mexico, Philippines, Australia, New Zealand, New Caledonia, Peru, Denmark, Thailand and Japan and 57 scientists from different research institutions in India took part in the symposium. The object of the symposium was to exchange views on zooplankton in tropical and sub-tropical regions and to evaluate the recent advances made in these areas.

The papers received for this symposium were grouped under plenary sessions and sectional meetings. Invited papers were read in the plenary sessions.

The sectional meetings were organized on Systematics and Biogeography, Ecology, Energy Transfer, Culture, Biochemistry, and Systems Analysis and Modelling.

The symposium started with the first plenary session by Dr T. Onbe (Japan), who spoke on the biology of the marine cladocerans in warm waters.

The first sectional meeting on Systematics and Biogeography, chaired by Dr Vagn Hansen and Dr A. K. Nagabhushanam, included several interesting papers on different planktonic larvae, their taxonomy, distribution and species diversity; descriptions of new species of calanoid copepods, chydorid cladoceran, larvacea, etc; penaeid prawns of Goa; possibility of using planktonic hyperiid amphipods as indicator species of water masses in the Gulf of Thailand and South China Sea, etc.

The second session on Ecology had papers on: distribution and abundance of the zooplankton; fish larvae studied from UNDP samples; ecology of zooplankton in different areas of the Indian coast; probable existence of a deeper ecological niche at Aroor inside the Cochin backwater system; penaeid prawn larval migration into estuarine system of Goa including the larvae of one of the strictly marine species; and the pollution hazards to zooplankters in tropical waters.

The session on Energy Transfer, presided over by Dr M. Vannucci, discussed the transfer coefficients from primary to secondary levels of production for two different estuarine systems, one on the east coast and the other on the west coast of India.

The session on Culture had 20 papers, several of which were concerned with the laboratory culture of decapod crustaceans in order to trace the larval history, while one of the contributions dealt with the laboratory technique of rearing the giant brackish water palaemonid prawn larvae. Dr E. G. Silas reviewed the culture techniques used in the Central Marine Fisheries Research Institute, Tuticorin, for large-scale laboratory culture of larvae of commercially important penaeid prawns and subsequent rearing of the juveniles in natural ponds. Larval history and mass culture of copepods and the influence of juvenile hormone mimics on development and metamorphosis of larvae of barnacles were also the subjects of a few papers.

The session on Biochemistry, presided over by Prof. J. E. G. Raymont, had papers on: excretion of iron by a planktonic decapod crustacean and copepod; and differences in free and bound amino acid patterns in juveniles and adults of species of prawns.

The session on Systems Analysis and Modelling, presided over by Dr P. Fenaux (France), had papers on: theoretical model of the food chain of some warm water environments; regression model of zooplankton production in different areas of the Indian Ocean; etc.

The scientific sessions were followed by a round-up session chaired by Prof. Raymont. In planning ahead, Prof. Raymont expressed the need for giving proper emphasis to include depth, micronutrients, particulate matter and turbidity in ecological studies to have a closer look at the living organisms in the natural environment.

CSIR Polytechnology Clinic Inaugurated

A CSIR Polytechnology Clinic aimed at transferring technology from laboratories to industries was opened in Bangalore in October 1976. The Clinic was formally inaugurated on 16 November 1976 by Shri S. M. Krishna,

Minister for Industries and Parliamentary Affairs, Government of Karnataka.

The inaugural function was held at the Visvesvaraya Industrial and Technological Museum, Bangalore. Prof. Y. Nayudamma, Director General, Scientific & Industrial Research, addressed the gathering. Shri Veerappa Moily, Minister of State for Small Scale Industries, presided over the function. The function was attended by nearly 600 people comprising industrialists, business people, scientists and technologists, state government officers, etc.

Prof. Nayudamma, in his address, spelt out five kinds of help offered by CSIR which were relevant and appropriate both in rural and urban areas: (i) on an as-is-where-is basis; (ii) through a consultant mutually agreed upon by CSIR and the entrepreneur with the consultant preparing a management investment report; (iii) where the technology is considered risky, CSIR puts up half the capital with the provision that the entrepreneur can buy out CSIR share if the venture proves successful; (iv) where CSIR is confident of its technology but the entrepreneur is not, it puts up 26% of the capital; and (v) provides assistance on a turn-key basis with consultancy mutually agreed upon between CSIR and the entrepreneur. In order to prove that the technology developed by CSIR laboratories is good for industrial applications, setting up its own industry to prove its technology would be the sixth kind of assistance.

He said that CSIR had done depth studies to diagnose the problem of industry in each state and had worked out ways in which it could help them with its vast resources of talent covering every branch of science and technology.

Defining the function of the polytechnology clinic, Prof. Nayudamma said that it was based on the polymedical concept. The clinic was an earnest endeavour to take science to the doors of users.

Shri Krishna, in his inaugural speech, said that the polytechnology clinics had a bigger role to play than solving research and development problems of the industry. They should develop alternative technology and also bridge the gap between the technology generator and the technology user. Shri Krishna called for better coordination between industry and laboratories on the one hand and the government on the other.

Shri Veerappa Moily appealed to industrialists to make full use of the unprecedented offer of facilities by CSIR. He also complimented CSIR on developing the needed linkages between research and development.

Exhibition of Herbal Drugs : NBG

The National Botanic Gardens (NBG), Lucknow, organized an exhibition of Indigenous Herbal Drugs from 20 to 22 November 1976. Eight other organizations engaged in this field, viz. Central Council for Research in Indian Medicine and Homoeopathy, New Delhi; Hamdard (Waqf) Laboratories, Delhi; Zandu Pharmaceutical Works Ltd, Bombay; National Dawakhana, Calcutta; Institute of Medical Sciences, Banaras Hindu University (BHU), Varanasi; Sanskrit University Ayurvedic College, Varanasi; Ayurvedic Mahavidyalaya, Gurukul Kangari, Hardwar; and State Ayurvedic College and Hospital, Lucknow, participated in the exhibition.

The exhibition was divided into four main sections: (i) History section gave a brief history of origin and development of Ayurveda and Unani systems, together with their inter-relationship and an account of their contribution to the modern systems of medicine and listing the causes of their decline; (ii) Indigenous Herbal Drugs section displayed about 600 important drugs used in Ayurveda and Unani systems and the respective plants in the forms of paintings, photographs, herbarium sheets, numerous live specimens and authentic drug samples, and explained the main medical concepts of these systems; (iii) Controversial Drugs section gave an account of a large number of well-known, and important drugs, the correct botanical identifications of which as well as of their plants were still disputed; and (iv) Pharmacognosy section brought out the role of pharmacognostical studies to help distinguish drugs and their substitutes/adulterants as also to help standardize the drugs and their agro-techniques.

Two additional sections were those of the industry and the educational institutions.

Dr T. N. Khoshoo, Director, NBG, in his welcome address, explained the main aims and objectives of the exhibition, viz. to highlight the role and scope of the indigenous systems of medicine in the amelioration of human sufferings and the wealth of medicinal flora abounding in the country, to focus attention on the reasons for relegating these systems into background and the factors limiting the maximum exploitation of indigenous medicinal plants. He referred to the increasing trade in herbal drugs and revealed that India exported these drugs worth Rs 8.33 crore during April-September 1976, as against Rs 4.35 crore during the same period last year. Giving a brief account of the R&D work being done by NBG on indigenous herbal drugs, Dr Khoshoo said that NBG was engaged in establishing the correct botanical identification of these drugs and their plants as well as their substitutes and adulterants. It was also engaged in standardizing the drugs and their agro-techniques. NBG had screened 1500 plant specimens for alkaloids and other constituents and had discovered 600 new sources of medicinally useful compounds.

Dr M. Chenna Reddy, Governor of Uttar Pradesh, who inaugurated the exhibition, referred to the salient features of the Ayurvedic system of medicine. Dr Reddy dwelt on the positive aspects of this system, particularly that of keeping a man healthy by pro-

Dr M. Chenna Reddy inaugurating the exhibition at NBG

tecting him against disease and contrasted these with the mainly 'curative' nature of the modern systems. He said that the indigenous systems had delved much deeper in the realm of medicine than the modern ones and could enrich the latter in many ways. The indigenous systems should be practised and patronized not because these were cheaper, but because these were better and specially suited to the Indian conditions. He also made a plea for evolving a composite system of medicine which could be enforced throughout the country.

Hakim M. A. Razzack, Deputy Advisor (Unani Medicine) of the Union Ministry of Health and Family Planning, also stressed on indigenous drug industry's need for an organization, similar to the bureau of plant industry in western countries, which combined the collection and dissemination of information and research investigations on indigenous drugs. He pleaded for a proper management of wild herbal resources and well-organized commercial cultivation of drug plants, not only around their known habitats but in other areas as well.

On this occasion was released NBG's 'Directory of pharmaceutical manufacturers of India employing herbal drugs and their proprietaries'.

A meeting of the representatives of the Botanical Survey of India, the Central Council for Research in Indian Medicine and Homoeopathy and NBG was also held on 20 November to discuss the report of the National Commission of Agriculture on indigenous drugs and formulate guidelines for the course of action to be followed by these three organizations.

Unesco Panel Meeting on Marine Science Development

The Unesco Advisory Panel on Marine Biological Centre met at the Regional Centre of the National Institute of Oceanography, Cochin, from 21 to 23 October 1976. The meeting was chaired by Prof. J. E. G. Raymont of UK and attended by several marine scientists from USA, Canada, UK, Mexico, Japan, France, Denmark, New Zealand, Peru and India, in addition to the Unesco staff.

The panel discussed the various important aspects of development of marine sciences with special reference to zooplankton research in Cochin, Mexico and Singapore. The Director, National Institute of Oceanography (NIO), Goa, who was reporting to the meeting, said that there was keen interest in the growth and development of the regional centre of NIO at Cochin, particularly in relation to local problems related to marine science. The advisory panel fully supported such a development for the Cochin centre. The R&D work to be enhanced at the regional centre would greatly aid the developments of aquaculture, pollution control, beach erosion problems and the study of living resources of the seas around India.

Parthenium Control

The problem of the ubiquitous 'Gajar gavat' (*Parthenium hysterophorus*) is being investigated from several interdisciplinary angles at the National Chemical Laboratory (NCL), Poona. A new pre-emergent herbicide formulation has been developed at NCL. Preliminary field trials have demonstrated its efficacy in controlling the weed. The novelty of the new formulation lies in its safe levels of the active ingredient in a slow-release form for selective action on *Parthenium*. Thus the formulation affords better control with a considerably less quantity of the active ingredient and reduces damage to non-target objects (e.g. grass, crops, etc.) and to the environment. A single application of the new formulation serves the purpose of two applications of the conventional herbicides. A patent application covering the invention has been filed. Multilocational trials are in progress.

The entomology group of the laboratory has also been actively engaged in tackling this problem. Recently, this group has discovered a pest which is seen to infest the weed to a high degree around the laboratory. The caterpillar-like pest feeds on the stem tissue down to the roots, which causes

the whole plant to wilt and die. Attempts are being made to rear the insect in the laboratory to study its bionomics. If the pest does not attack economically important plants this could be a major breakthrough for eradicating the weed by an ecologically and economically attractive method.

The biological activity of the various solvent extracts, fractions, etc. of the herb were also examined. The principal sesquiterpene lactone antigen, parthenin, has been shown to exhibit anti-feedant properties against many species of insects.

Water Evaporation Retardants

The National Chemical Laboratory (NCL), Poona, has started a research programme on 'Conservation of water by employing water evaporation retardants' at Indira Percolation Tank, near Khed, in Poona district. The programme, undertaken in collaboration with the Directorate of Irrigation Research and Development (DIRD) of the Government of Maharashtra, was formally inaugurated on 14 November 1976. In these experiments, the efficacy of ethylene oxide condensates of C_{16}, C_{18} and C_{22} straight-chain alcohols developed by NCL will be tried on reservoir-scale experiments on a few selected tanks in Maharashtra.

Dr B. D. Tilak, Director, NCL, speaking at the inaugural function, informed the gathering that over 60% reduction in evaporation was achieved in evaporimeter-scale experiments carried out at NCL. Even a 30% retardation in water evaporation, he said, would have a significant socio-economic impact on the life of the people of the command areas of these reservoirs.

These experiments, if successful, will have tremendous possibilities, since the techniques can then be extended to all the medium and large reservoirs of the country. The extra water available will alleviate water shortage problems and help farmers to grow rabi and summer crops, which would bring them additional returns.

Structural, Electrical and Optical Properties of Some Semiconducting Chalcogenides

The chalcogenide semiconductors such as those of As, Sb and Cd find applications in optics, electronics, electrophotography and especially in electrostatic imaging, television engineering, and switching and memory devices. A new chemical method for the preparation of thin film chalcogenides of As, Sb and Cd was developed at the National Chemical Laboratory (NCL), Poona, by Shri R. K. Khandekar, who worked under the guidance of Dr A. P. B. Sinha, Scientist, NCL. The electron and X-ray diffraction studies, electrical conductivity, thermoelectric power, I-V characteristics and optical absorption studies were carried out on the films of As_2Te_3, As_4Se_4, Sb_2Te_3, Sb_2Se_3, CdTe and CdSe prepared by the new chemical method. Vitreous compound As_4Se_4 was also prepared by melt quenching method, and DTA and TGA measurements were carried out in addition to studying the properties mentioned above.

Except Sb_2Se_3 which was amorphous, all other As, Sb and Cd chalcogenide films prepared by the chemical method were crystalline as shown by electron diffraction studies. As_2Te_3 and As_4Se_4 were monoclinic, Sb_2Te_3 was rhombohedral, and CdTe and CdSe were cubic. The film of Sb_2Se_3 was amorphous, showing only diffused rings on the pattern.

The X-ray diffraction pattern of vitreous As_4Se_4 prepared by melt quenching showed broad haloes indicating its glassy nature. DTA, DTG and TG curves were studied for the compound As_4Se_4 as well as for the mixture of As and Se of the same composition. These showed that the compound As_4Se_4 was single phased. The electrical conductivity showed single activation energy (ΔE) as indicated against each compound: Film As_2Te_3 0.47 eV, As_4Se_4 (bulk glassy) 0.99 eV, film Sb_2Te_3 0.12 eV, film CdTe 0.65 eV, film Cd Se 0.24 eV.

The crystalline films of As_4Se_4 obtained by chemical deposition showed two activation energies of 0.15 and 0.94 eV. The vacuum-evaporated thin films of melt quenched As_4Se_4 glass also showed two slopes at 0.13 and 0.94 eV. However, the bulk glassy As_4Se_4 showed only one activation energy (0.90 eV). The bulk As_4Se_4 doped with 2% Cd, Zn, Sn or Ge showed no effect, but with Ag and Cu impurities, it gave two slopes: As_4Se_4 2% Ag (0.20 and 0.55 eV) and As_4Se_4 2% Cu (0.13 and 0.58 eV).

The thermoelectric power coefficient S for thin film of Sb_2Te_3 gave a constant value ($50 \pm 20 \mu V/°K$) in the temperature range from 28 to 110°C.

The ac I-V characteristics were linear up to applied voltage of 30 V for all the compounds. However, the dc I-V plots for As_2Te_3 and As_4Se_4 films were linear up to applied field of $\sim 10^5$ V/cm, and above this field an abrupt rise in current was observed with subsequent fall by a factor of 4-5, indicating the probable formation of high-conductivity filament. In the case of Sb_2Se_3 and Sb_2Te_3 the plots of log I vs log V gave straight lines with slope value equal to 2, indicating space charge limited current.

Invariably, the optical absorption coefficient α for all the compounds studied, except amorphous Sb_2Se_3, obeyed the relation $C(h\nu - Eh_{g\,opt})^{1/2}/h\nu$ indicating that the compounds had direct band gap. The amorphous Sb_2Se_3 showed the following dependence $C(h\nu - E_{g\,opt})^2/h\nu$ with an indirect band gap equal to 1.25 eV. The optical band gap ($E_{g\,opt}$) for evaporated films of As_4Se_4 was 2.0 eV and for chemically deposited crystalline As_4Se_4, 1.95 eV. The optical band gaps for the rest of the compounds were : As_2Te_3, 1.1 eV; Sb_2Te_3, 0.27 eV; CdTe, 1.6 eV; CdSe, 1.75 eV; and Sb_2Se_3, 1.25 eV.

This work led Shri Khandekar to the award of a Ph.D. degree of the University of Poona.

Progress Reports

CMERI Report : 1974-76

The Central Mechanical Engineering Research Institute (CMERI), Durgapur, has brought out its bi-annual report (1974-76). The report (140 pages) highlights the institute's R&D activities which have made considerable impact on the various programmes of the engineering industries of the country, particularly in respect of import substitution, export promotion and development of indigenous technological know-how. There had been marked rise in the institute's efforts to undertake sponsored and collaborative research. While identifying the problems, CMERI laid stress on development in the fields having economic and social bearing, and in the fields already marked by the National Committee on Science & Technology, the state government, and other related agencies. Thus, the institute's R & D programme during the period under review laid more stress on developing (i) agricultural machinery and equipment, (ii) road-making machines, (iii) industrial machinery, (iv) refrigeration machinery for food preservation, (v) welding machinery and processes, and (vi) packaging machinery.

Efforts were made to increase the volume of sponsored research and interlaboratory collaboration. Basic and application-oriented researches were also carried out.

Some new infrastructural facilities to cater to the needs of the industries have also come up. These include the radiography laboratories at the Mechanical Engineering Research & Development Organisation (MERADO) centres at Poona, Ludhiana and Madras, and the tribology laboratory at the headquarters. The room calorimeter, the outcome of a major infrastructural project, was ready for testing air-conditioners.

A few research projects in the fields of flame stabilization and fluidized bed combustion yielded commendable results. A prototype of single-stage centrifugal compressor developed by the institute has gone through laboratory trial. Amongst industrial machinery, CMERI has already transferred the know-how for automatic belt weighing machine. The first prototype of a power tiller developed by this institute underwent a 500 hr test run. It will shortly go to rigorous field trial. In the field of solar energy, the institute concentrated on developing solar pump and compact solar food dryer.

Processes released to industries during the period under review relate to: (i) powered cycle rickshaw, (ii) time switch for home appliances, (iii) portable oxy-gas cutting machine, (iv) electronic spark ignition system, (v) manual arc welding electrode holder, and (vi) high-speed paper lapping machine. Processes on electronic load controller, effect of metallurgical variables on wear characteristics of tool steels in metal cutting and end metal forming, and pencil type coating thickness gauge were released to the National Research Development Corporation of India for commercial exploitation. Processes on (i) regenerative pump, (ii) centrifugal clutch, and (iii) smokeless domestic oven were ready for commercial exploitation. Thirteen patents were filed during this period. Several training courses for engineers and technicians from industries were arranged at CMERI and the MERADO centres. Technical consultancy and testing services rendered to industries by CMERI/MERADO totalled over four hundred. Seventy-six papers were published and 27 papers presented at seminars, symposia, etc. The institute's financial inputs for 1974-75 and 1975-76 were Rs 11.75 and Rs 12.79 million respectively; its earnings for these years amounted to Rs 10.21 and 12.89 lakh respectively.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Carbon Dioxide Solidifier

Solid carbon dioxide is used in large quantities in educational institutions, research laboratories and chemical plants as a cooling agent. At present, solid carbon dioxide is produced using a very inefficient method such as expanding high pressure carbon dioxide gas from a commercial cylinder in a cloth bag. The carbon dioxide solidifier developed at the National Physical Laboratory (NPL), New Delhi, produces solid carbon dioxide and provides a cold space for storing chemicals, photographic materials, etc. It is used as a cooling agent up to $-77°C$.

Small quantities of solid carbon dioxide are produced by expanding carbon dioxide from a commercial cylinder through a nozzle into a cloth bag. The amount of solid carbon dioxide produced depends on the pressure and temperature of the high pressure gas before expansion. By lowering the temperature of the gas from commercial carbon dioxide cylinder, the production of carbon dioxide can be enhanced. By lowering the temperature to $-20°C$, one can get 45 to 50% of the gas in solid state. In this machine, the pressurized carbon dioxide gas is pre-cooled to $-20°C$, or lower, in a refrigerator evaporator coil. For producing solid carbon dioxide at the rate of 2-3 kg per hour a Freon refrigerator of 0.25 tonne capacity would be sufficient.

A prototype of the machine has been made and is working in the laboratory. The output of the prototype is 2-3 kg/hr. However, with the know-how developed, it is possible to make machines of higher capacity also.

It is estimated that the demand for the machine is obout 50 units per year.

The plant and equipment required are Freon charging equipment, tube venders, flaring tool, tube cutters, oxyacetylene torch set and a small lathe, Freon leak detector, etc.

The main raw materials required are copper tubing of 3/8 in. diam., Freon compressor of 0.5 tonne capacity with motor, thermocole, cabinet, expansion valve and temperature indicator.

The approximate investment for a unit capable of producing 50 machines per annum would be as follows: fixed capital on land and building, Rs 40,000; fixed capital on installed equipment, Rs 35,000; and working capital, Rs 65,000. The cost of production will be approximately Rs 4600 per unit.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Dibutyltin Stabilizers for PVC

Dibutyltin stabilizers effectively protect PVC against degradation caused by heat, light and oxygen. Some of the widely used stabilizers are dibutyltin dilaurate (DBTL) and dibutyltin maleate (DBTM). The exact demand for these stabilizers is not known but the demand for various stabilizers may be of the order of 50 tonnes per annum. At present, the demand for these stabilizers is met through imports. There are, however, a number of applications pending for foreign collaboration which shows that the demand for these products will go up in the coming years.

The National Chemical Laboratory (NCL), Poona, has successfully developed the process for the manufacture of dibutyltin stabilizers for PVC, starting from easily available materials. The process consists in the preparation of the basic intermediate dibutyltin oxide from the tin metal. This step is achieved by the interaction of butanol, iodine and red phosphorus to produce butyl iodide, which is made to react with tin metal to produce the dibutyltin diiodide. The diiodide is hydrolyzed to dibutyltin oxide. Iodine is recovered and recycled. Dibutyltin oxide as obtained above is esterified with lauric acid (distilled coconut fatty acids) or maleic anhydride under controlled conditions to yield DBTL and DBTM respectively. The process has been standardized on one kg/batch for dibutyltin oxide and 5 kg/batch for DBTL and DBTM. The products, viz. DBTL and DBTM, have been tested by a reputed firm and have been found to be satisfactory.

Butanol, iodine, red phosphorus, tin, caustic soda, maleic anhydride and lauric acid are the major raw materials required for the manufacture of these stabilizers. Iodine, tin and maleic anhydride will have to be imported for the time being. Other raw materials are available indigenously.

Glass-lined vessels fitted with reflux condensers and stirrer for preparation of butyl iodide and dibutyltin diiodide, stainless steel (SS) vessel for hydrolysis of diiodide, wood-lined vessel for iodine recovery, SS vessel fitted with stirrer and condenser for esterification, filtration unit for iodine, SS centrifuge and drying oven are the major items of plant and equipment. All these are indigenously available, or can be fabricated locally.

A plant capable of producing 25 tonnes of DBTL and 25 tonnes of DBTM is suggested as an economic unit for these products. The capital outlay for a plant of this size has been estimated at Rs 25 lakh (Rs 17 lakh as fixed capital on plant and building, and Rs 8 lakh as working capital). The cost of production of the material works out at Rs 42 per kg against the landed price of the imported product at Rs 60-70 per kg.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Lacquer for Corrosion Prevention

Corrosion preventive lacquers are known to be prepared using solutions of bitumen or plasticized resins in volatile solvents. However, lacquers based on plasticized resins are costly for use as temporary protectives for structurals like reinforcement rods, angle irons and boiler tubes. Lacquers based on bitumen have no flexibility and crack, exposing the metal surface. Keeping in view the drawbacks of the hitherto known corrosion preventive lacquers, investigations were undertaken at the Central Electrochemical Research Institute (CECRI), Karaikudi, and an inexpensive lacquer based on indigenously available materials has been developed successfully (Indian Pat. 126663). The process consists in dissolving of asphalt or coal tar pitch, resin and corrosion inhibitor in a volatile solvent.

The lacquer can be used for the preservation of simple metal assemblies, e.g. cane shafts, crank shafts, laps and dies, hand tools, light steel sections like rods and tubes, etc. It may also be suitable for the preservation of metal stores during storage and transit. It fulfils the IS specifications for temporary corrosion fluid and hard film solvent deposit (IS: 1153-1957), and the product satisfies more stringent conditions in respect of certain properties like protection, flash point, stability, easy removal and different modes of application.

The process has been studied on a laboratory scale. Two litres of the corrosion preventive lacquer were prepared at a time.

Tar, plastics, gum resin, ester gum and a solvent are the main raw materials required in the process. All these are available indigenously. Mild steel storage tanks, stirrers, weighing balance

and mild steel mixer are the main equipment required.

The suggested capacity for an economically viable unit is 69,000 litres of corrosion preventive lacquer per annum. The total capital investment to put up such a unit is estimated at Rs 2,87,640 (fixed capital on building, Rs 96,000; fixed capital on plant, Rs 58,506; and working capital, Rs 1,33,134). The cost of production has been worked out to be Rs 7.37 per litre.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

Solid State Constant Temperature Anemometer for Fluid Flow Studies

Anemometers are used for measuring the velocity of fluids. The most common are cup type, deflecting vane type and hot wire type. The cup anemometers are not accurate for measuring flow rate or flow quantity because of the large number of variables affecting calibration. The deflecting vane anemometers operate by allowing a jet of air or gas to impinge directly on a pivoted vane and are used for measuring duct velocities in ventilating and air-conditioning work. The hot wire anemometer consists of a small resistance wire inserted in the fluid stream and heated by electric current. There are three methods of determining the velocity of flow. First, the temperature of the wire can be maintained constant by adjusting the current flow through the wire and the velocity of flow is then proportional to the current through the resistance wire. Second, the temperature difference in the flowing fluid before and after the resistance element can be maintained constant by adjusting the current flow through the element. The velocity of flow is then proportional to the current flowing through the element. Third, the current in the resistance wire can be maintained constant, and the temperature, and therefore the resistance, of the wire is measured.

The National Aeronautical Laboratory (NAL), Bangalore, has developed a solid state constant temperature anemometer for fluid flow studies in wind tunnels. Applied magnetic field and the configuration and dimensions of the conducting strip have been made use of in these devices. These devices have been optimized and standardized for operation in the specified frequency ranges.

The laboratory has developed large numbers of three port and four port coaxial circulators in S and C bands. These circulators were supplied to the Experimental Satellite Communication Earth Station, Ahmedabad; Space Science and Technology Centre, Trivandrum; Telecommunication Research Centre, New Delhi; Tata Institute of Fundamental Research, Bombay; and the Central Electronics Engineering Research Institute, Pilani. The performance of the circulators was found satisfactory.

The specifications of the circulators developed at NAL are as follows:

Three port coaxial circulators

VSWR (max.)	: 1.25
Loss (max.)	: 0.5 dB
Isolation (min.)	: 20 dB
Connectors	: N type, female
Configuration	: Y type, low power
Covering frequency ranges (in GHz)	: 2.7 to 3.6, 3.0 to 4.0, 3.7 to 4.2, 4.4 to 5.0 and 5.0 to 6.0

Four port coaxial circulators

VSWR (max.)	: 1.25
Loss (max.)	: 0.5 dB—0.7 dB
Isolation (min.)	: 20 dB—40 dB
Connectors	: N/OSM type
Covering frequency ranges (in GHz)	: 2.7 to 3.4 and 5.2 to 6.0

Three port circulators are used in transmit and receive chains of microwave communication and radar systems. They can be used as isolators, by terminating the isolated port with a matched oscillator used in such communication networks. Four port circulators are used as duplexers in transponders and isolation devices in low noise RF amplifiers which are employed as front ends in microwave receivers to improve the sensitivity performance. Also, four port circulators can be converted into high ratio isolators and signal samplers by terminating the unused ports with matched terminations.

The raw materials required are microwave ferrite, aluminium alloy, ceramic magnets, absorbing materials, N-type panel connector, OSM-type panel connector, MS plate and aluminium sheet. All are indigenously available except panel connectors, RF absorbing materials and panel termination (if circulators are to be converted into isolators).

The main equipment required are ac/dc millivolt meter, 10 MHz angle beam oscilloscope, multimeter and soldering iron. All are available indigenously.

Due to relatively low turnover, it is necessary that the project should be taken up only by those firms which have the background, experience and standing in the production of electronic instruments. Secondly, the firms should have facilities to calibrate the instrument in wind tunnel for measurement studies.

The capacity of an economically viable unit as suggested by NAL is 20 anemometers per annum. The fixed capital on plant and the working capital are estimated at Rs 16,000 and Rs 25,000 respectively. The estimated cost of production would be Rs 4000 per unit.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PERSONNEL NEWS

Appointments/Promotions

Dr R. A. Mashelkar

Dr R. A. Mashelkar has been appointed Scientist E at the National Chemical Laboratory, Poona, with effect from 15 November 1976.

Dr Mashelkar (born 1 January 1943 in Goa) has had a brilliant academic record. He obtained B. Chem. Engg., M.Sc. (Tech.) and Ph.D. (Tech.) degrees from the University of Bombay. Dr Mashelkar held Sir Dorab Tata scholarship for the years 1960-66; won the special scholarship for being first class first in chemical engineering in the University Department of Chemical Technology during 1962-65; and won Amila Ghosh prize for scoring the highest marks in chemistry during 1963-64.

In 1969, Dr Mashelkar joined the Chemical Engineering Department of the University of Salford (UK) as a Leverhume Research Fellow. In 1970, he was appointed lecturer in the Department of Chemical Engineering in that university, and continued there till November 1976. During 1975-76, Dr Mashelkar was Visiting Associate Professor in the Chemical Engineering Department of the University of Delaware (USA).

Dr Mashelkar's research interests are in the field of polymer production and processing, rheology and transport phenomena in non-Newtonian fluids. He has published more than 50 research papers. He is currently writing a book entitled 'Non-Newtonian Heat and Mass Transport Phenomena'. Dr Mashelkar is an editor of *Chemical Engineering Communications*.

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The following personnel have been promoted at the National Geophysical Research Institute (NGRI), Hyderabad: Shri G. Hanumantha Rao (as Scientist C, 18 May 1975); Shri P. S. Aravamadhu (as Scientist C, 19 Sep. 1976); Dr P. R. Reddy (as Scientist C, 28 Oct. 1976); Shri T. Mohan Das (as Scientist B1, 1 July 1976); Shri R. K. Verma (as Scientist B, 30 May 1976); and Shri B. S. Rathore (as Scientist A, 1 June 1975).

* * *

Appointments at NGRI include : Shri Rabindranath Panda (as Scientist C, 1 Sep. 1976); Shri Rana Mohan Prasad (as Scientist C, 2 Nov. 1976); Shri S. Narayana (as Scientist B, 19 Oct. 1976); and Shri Devadoss John (as Scientist B, 28 Sep. 1976).

* * *

Shri K. D. Padia has been appointed on promotion as Scientist C at the Central Salt & Marine Chemicals Research Institute, Bhavnagar (6 Dec. 1976).

* * *

Shri K. P. Singh has been appointed as Scientist B at the Regional Research Laboratory (RRL), Jorhat (28 Oct. 1976).

* * *

The following personnel have been promoted at RRL, Jorhat : Dr T. K. Dutta (as Scientist E, 26 Oct. 1976); Dr H. D. Singh (as Scientist E, 27 Nov. 1976); Shri C. N. Saikia (as Scientist B, 2 Aug. 1976); Shri R. C. Srivastava (as Scientist B, 19 Oct. 1976); Dr M.K. Roy (as Scientist B, 27 Oct. 1976); and Dr P. K. Roy (as Scientist B, 27 Oct. 1976).

Dr P. N. Mukherjee

Dr P. N. Mukherjee has been appointed, on promotion, Scientist F in the Central Fuel Research Institute (CFRI), Dhanbad, with effect from 10 November 1976. Born in 1924 in East Bengal (now Bangladesh) Dr Mukherjee had a brilliant academic career in Calcutta and Dacca universities and obtained M.Sc. (1946) in applied chemistry and D.Phil. (1962) from the University of Calcutta. Dr Mukherjee started his research career at the Indian Institute of Science, Bangalore in 1947. He joined CFRI in June 1949. Dr Mukherjee participated in the summer project at the Massachusetts Institute of Technology, USA, in 1952. He visited the University of Bradford, UK, in 1970 under the Exchange of Scientists programme and studied modern research tools for surface science and catalysis.

At CFRI, Dr Mukherjee's research interest during early years was in the field of coal science, specially, the physico-chemical properties of coal and its degradation products. In recent years, his major fields of research have been adsorption surface chemistry and heterogeneous catalysis. He has more than 50 research papers and several patents to his credit.

PATENTS FILED

25/Del/76 : A process for the production of wet heat resistant and non-shrinkable leather, K. J. Kedlaya & T. S. Ranganathan—CLRI, Madras.

24/Del/76 : A process for salvaging cast iron, brass and aluminium castings, S. K. Bhattacharya, N. D. Das & S. Dasgupta—CMERI, Durgapur.

27/Del/76 : Modified frame for powered cycle rickshaw, P. K. Das & S. L. Srimani—CMERI, Durgapur.

31/Del/76 : Improvements in or relating to the electrolytic reduction of *o*-nitroanisole to *o*-anisidine, H. V. K. Udupa & P. N. Anantharaman—CECRI, Karaikudi.

26/Del/76 : Metal powders by spraying technique, K. J. Rao & M. R. Rao—NAL, Bangalore.

32/Del/76 (divided out of Pat. No. 363/Cal/75) : A process for the synthesis of substituted benzoxazine-2-thiones, (Mrs) R. Bindra, H. Singh, S. Sharma, R. N. Iyer, S. K. Avasthi, J. Kumar & O. P. Srivastava—CDRI, Lucknow.

2/Del/76 : Improvements in or relating to the preparation of fine particle size silica filters suitable for adoption as reinforcing agent for rubber, S. N. Ghadge, C. S. S. Inamdar & N. P. Suryanarayana—IRMRA, Thana.

23/Del/76 : Improvements in or relating to a process for hydrogenation of glucose, P. Heramb & R. P. Verma —NCL, Poona.

1725/Cal/76 : Improvements in or relating to the synthesis of modified phenolic resins and use thereof in rubber compounding, B. Banerjee & G. B. Desale—IRMRA, Thana.

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